

Bimbara Rathnayake

Department of Computer Engineering, University of Peradeniya, Sri Lanka

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PROFILE

I am a final-year Computer Engineering student with a strong interest in machine learning, biomedical engineering, computer vision, and artificial intelligence. I am passionate about using smart technologies to solve real-world problems in healthcare and assistive tools. I enjoy working with others, take initiative in team settings, and hope to continue doing meaningful research as a future academic and innovator.

EDUCATION

BSc.Eng (Hons.) in Computer Engineering <i>University of Peradeniya</i>	March 2021 - Present <i>Current GPA: 3.8/4.0</i>
Maliyadeva Girls' College <i>Physics: A, Chemistry: A, Combined Mathematics: A Z-Score: 2.1608 (Distinction Pass), National Rank: 520/35,000+</i>	Jan 2006 - Aug 2019

EXPERIENCE

Research Intern <i>The University of Melbourne</i>	July 2024 – December 2024
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Worked on accessible gaming interfaces for children with cerebral palsy using embedded systems:

- Developed a capacitive pillow controller using Arduino, custom circuits, and ergonomic design for children with limited mobility.
- Built an accelerometer-based motion controller with real-time gesture recognition.
- Conducted usability testing with expert feedback; prioritized safety and responsiveness.
- Drafted a research paper based on the design and development process of the gaming interfaces.
- Technologies: Arduino, Accelerometers, C/C++

Undergraduate Teaching Assistant <i>University of Peradeniya</i>	January 2023 – Present
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Assisted in labs and tutorials for core computer engineering courses:

- **GP 106 - Computing:** Python programming
- **CO 223 - Computer Communication Networks**
- **CO 224 - Computer Architecture:** Verilog, ARM Assembly
- **CO 544 - Machine Learning and Data Mining**
- **CO 1030 - Data Structures and Algorithms**

Technical Writer <i>Personal Blog</i>	2024 – Present
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Write technical articles on embedded systems, machine learning, and biomedical computing:

- Focused on simplifying complex concepts through practical tutorials and research-based insights.

Extending the GSOM for Hidden Structures and Relationships in Data | *Group* | | Jan. 2025 – Present

- Ongoing research project aimed at theoretically validating the Growing Self-Organizing Map (GSOM) as a topology-preserving feature map, and demonstrating its strengths in uncovering hidden structures in unsupervised data.
- Compared GSOM with Self-Organizing Map (SOM) using quantitative topology preservation metrics (e.g., ZM, CM, TP, TE) on synthetic and real datasets.
- Integrated Data Skeleton Modeling (DSM) into GSOM to enhance cluster representation and explore internal data relationships.
- Current focus: Hierarchical clustering capability and modeling individual-specific (idionomic) data features.
- Experiments conducted using multidimensional datasets including shape-based, FCPS, and health datasets.
- Technologies: Python, NumPy, Scikit-learn, Matplotlib, Pandas.
- Contribution: Led development of GSOM+DSM prototype, implemented custom topology evaluation tools and began drafting research publication.

Pulse Oximetry and Sleep Apnoea Detection System | *Individual* May 2025 – Present

- Developing a biomedical signal processing system to detect obstructive sleep apnoea using pulse oximeters.
- Analyzing SpO2 and pulse rate variability to identify apnoea episodes and assess sleep quality through signal filtering, frequency analysis, and feature extraction.
- Exploring both deep learning and simpler machine learning models to classify anomalies and predict episodes of interest during sleep.
- Investigating novel embedding techniques for oxygen saturation signals to enhance predictive performance.
- Current progress: Completed literature review and public dataset analysis; developing signal preprocessing and model training pipeline.
- Technologies: Python, SciPy, NumPy, Matplotlib, Signal Processing, FFT, Machine Learning, pyPPG Toolbox.

BeeZee: Smart Beehive Monitoring System | *Group* | | Nov. 2023 – June 2024

- An innovative system to monitor bee colonies and detect early signs of abscondment. - A collaborative research project with the Faculty of Agriculture, University of Peradeniya
- The initial step involves creating a cloud-connected data collection box with integrated sensors (humidity, temperature, CO2, weight) and a camera, visualized on a user-friendly dashboard.
- Currently working on gathered camera footage of hive entrance to identify pollen-carrying bees using Image Processing techniques.
- Technologies: Raspberry Pi, AWS S3, IoT Core, Node.js, and MongoDB, OpenCV, TensorFlow, CVAT, YOLO
- Contribution: Built the entire backend infrastructure using Express.js and Node.js, integrating it with a MongoDB database. Currently working on enhancing the video frames and training the Yolo model for the bees.

CricVision: Cricket Analytics and Prediction | *Group* | | Mar. 2024 – July 2024

- CricVision utilizes data from recent international matches featuring the Sri Lankan cricket team.
- Through the application of machine learning algorithms, it predicts the impact of individual players on match outcomes.
- These predictions offer valuable insights that can be utilized by teams and fans to understand the dynamics of the game better.
- Technologies: Python, TensorFlow, Scikit-learn, Pandas, NumPy.
- Contribution: Developing machine learning components for predicting winning probability of a team.

VisitLog: Digital Reporting Platform for Technical Visits | *Group* | | Aug. 2023 – Nov. 2023

- Developed an efficient software application to streamline technical service visit documentation, covering repairs, troubleshooting, and maintenance tasks.
- Provided a mobile application for technicians and a desktop dashboard for company administrators, enhancing task management and oversight capabilities.
- Technologies: React.js, Flutter, Firebase, Figma.
- Contribution: Developed the entire Admin dashboard

Shopfinity: Online Shopping System | *Group* | Apr. 2023 – Jul. 2023

- Developed an e-commerce platform with admin dashboard for product and order management.
- Engineered backend systems for authentication and payment processing.
- Technologies: HTML/CSS, JavaScript, PHP, MySQL.
- Contribution: Led end-to-end development of the system.

TECHNICAL SKILLS

Languages: Java, Python, C, SQL , JavaScript, HTML/CSS, Verilog HDL, ARM Assembly , PHP
Frameworks: React, Node.js, JUnit, Express.js
Developer Tools: Git, VS Code, Visual Studio, PyCharm, IntelliJ
Libraries: pandas, NumPy, Matplotlib, Pytorch, TensorFlow, Keras, OpenCV

ACHIEVEMENTS

- Aces Coders v10.0** | *12-hour algorithmic programming competition* Oct. 2023
- Organized by the Association of Computer Engineering Students of the University of Peradeniya
 - Team Name - ByteBelles; National Rank - 20 (Out of 350+ participants)
- IEEE Xtream 17.0** | *24-hour algorithmic programming competition* Nov. 2023
- Team Name - ByteBelles; Global Rank - 3500 (Out of 7091 participants)
- Huawei ICT Competition** | *2023-2024 Sri Lanka* Nov. 2023
- Participated in the Cloud track, which included Cloud, Storage, Big Data, & AI. [View Details](#)
- Hackathon 2023** | *An inter-university hackathon organized by the ACES* May. 2023
- Ergofit: An IoT device aimed at enhancing the well-being of individuals by assisting in the maintenance of their health. [Watch Video](#)

CERTIFICATIONS

- Supervised Machine Learning: Regression and Classification:** DeepLearning.AI [View Certificate](#)
- Advanced Learning Algorithms:** DeepLearning.AI [View Certificate](#)
- Machine Learning with Python (with Honors):** IBM [View Certificate](#)
- Introduction to Deep Learning & Neural Networks with Keras:** IBM [View Certificate](#)
- Introduction to the Internet of Things and Embedded Systems:** University of California [View Certificate](#)

SOFT SKILLS

Public Speaking: Moderated several virtual and physical events organized by IET On Campus University of Peradeniya, Women in Engineering Student Branch Affinity Group of University of Peradeniya, and the [Hackers' Club](#) of University of Peradeniya

EXTRA-CURRICULAR ACTIVITIES & LEADERSHIPS HELD

- Secretary** Apr. 2024 – Present
IET (The Institution of Engineering and Technology) On Campus University of Peradeniya
- Director of Editorial** Mar. 2024 – Jan. 2025
IESL JIY (Institution of Engineers Sri Lanka – Junior Inventor of the Year)
- Treasurer** Jan. 2024 – Jan. 2025
Women in Engineering Student Branch Affinity Group of University of Peradeniya

REFERENCES

Prof. Roshan G. Ragel | roshanr@eng.pdn.ac.lk
Head of Department, Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Sri Lanka